United States Department of Agriculture,

BUREAU OF ANIMAL INDUSTRY—CIRCULAR NO. 69.

D. E. SALMON, D. V. M., Chief of Bureau.

TEXAS FEVER, OR SOUTHERN CATTLE FEVER.[a]

By Drs. D. E. Salmon and Theobald Smith.

[Revised in 1904 by Drs. Salmon and Mohler.]

This disease, also commonly known as splenetic fever, is a specific fever communicated by cattle which have recently been moved northward from the infected district, or which is contracted by cattle taken into the infected district from other parts of the world. It is characterized by the peculiarity among animal diseases that the animals which disseminate the infection are apparently in good health, while those which sicken and die from it do not, as a rule, infect others.

It is accompanied by high fever, greatly enlarged spleen, destruction of the red-blood corpuscles, escape of the coloring matter of the blood through the kidneys, giving the urine a deep-red color, by a yellowness of the mucous membranes and fat, which is seen more especially in fat cattle, by a rapid loss of strength, and by fatal results in a large proportion of cases.

This disease has various names in different sections of the country where it frequently appears. It is often called Spanish fever, acclimation fever, red water, black water, distemper, murrain, dry murrain, yellow murrain, bloody murrain, Australian tick fever, and tristeza of South America.

The earliest accounts we have of this disease date back to 1814, when it was stated by Dr. James Mease, before the Philadelphia Society for Promoting Agriculture, that the cattle from a certain district in South Carolina so certainly disease all others with which they mix in their progress to the North that they are prohibited by the people of Virginia from passing through the State; that these cattle infect others while they themselves are in perfect health, and that cattle from Europe or the interior taken to the vicinity of the sea are

[a] Reprint from Special Report on Diseases of Cattle, 1904.

17790—No. 69—05

attacked by a disease that generally proves fatal. Similar observations have been made in regard to a district in the southern part of the United States. This section is indicated by a quarantine line known as the Texas fever line, which determines the boundary between the noninfected territory above and the permanently infected districts below. It is changed yearly as a result of the dissemination or eradication of the cattle tick along the border, but has gradually receded, owing to the successful endeavors pushed forward to eliminate the ticks.

It was the frequent and severe losses following the driving of cattle from the infected district in Texas into and across the Western States and Territories which led to the disease being denominated Texas fever. It is now known, however, that the infection is not peculiar to Texas or even to the United States, but that it also exists in southern Europe, Central and South America, Australia, South Africa, and the West Indies.

When cattle from other sections of the country are taken into the infected district they contract this disease usually during the first summer, and if they are adult animals, particularly milch cows or fat cattle, nearly all die. Calves are much more likely to survive. The disease is one from which immunity is acquired, and therefore calves which recover are not again attacked, as a rule, even after they become adult.

When the infection is disseminated beyond the permanently infected district, the roads, pastures, pens, and other inclosures are dangerous for susceptible animals until freezing weather. The infection then disappears, and cattle may be driven over the grounds or kept in the inclosures the succeeding summer and the disease will not reappear. There are some exceptions to this rule in the section just north of the boundary line of the infected district. In this locality the infection sometimes resists the winters, especially when these are mild.

In regard to the manner in which the disease is communicated, experience shows that this does not occur by animals coming near or in contact with each other. It is an indirect infection. The cattle from the infected district first infect the pastures, roads, pens, cars, etc., and the susceptible cattle obtain the virus second hand from these. Usually animals do not contract this disease when separated from infected pastures by a fence. If, however, there is any drainage or washing by rains across the line of fence this rule does not hold good.

The investigations made by the Bureau of Animal Industry demonstrate that the ticks which adhere to cattle from the infected district are the only known means of conveying the infection to the bodies of susceptible cattle. The infection is not spread by the saliva, the urine, or the manure of cattle from the infected district. In studying

the causation and prevention of this disease, attention must therefore be largely given to the ticks, and it now seems apparent that if cattle could be freed from this parasite when leaving the infected district they would not be able to cause the malady. The discovery of the connection of the ticks with the production of the disease has played a very important part in determining the methods that should be adopted in preventing its spread. It established an essential point and indicated many lines of investigation which have yielded and are still likely to yield very important results.

Nature of the disease.—Texas fever is caused by an organism which lives within the red-blood corpuscles and breaks them up. It is therefore simply a blood disease. The organism does not belong to the bacteria, but to the protozoa. It is not, in other words, a microscopic plant, but it belongs to the lowest forms of the animal kingdom. This very minute organism multiplies very rapidly in the body of the infected animal, and in acute cases causes an enormous destruction of red corpuscles in a few days. How it gets into the red corpuscle it is not possible to state, but it appears that it enters as an exceedingly minute body, probably endowed with motion, and only after it has succeeded in entering the corpuscle does it begin to enlarge.

The various disease processes which go on in Texas fever, and which we may observe by examining the organs after death, all result from the destruction of the red corpuscles. This destruction may be extremely rapid or slow. When it is rapid we have the acute, usually fatal, type of Texas fever, which is always witnessed in the height of the Texas fever season—that is, during the latter weeks of August and the early weeks of September. When the destruction of corpuscles is slower, a mild, usually nonfatal, type of the disease is called forth, which is only witnessed late in autumn or more rarely in July and the early part of August. Cases of the mild type occurring thus early usually become acute later on and terminate fatally.

The acute disease is fatal in most cases, and the fatality is due not so much to the loss of blood corpuscles as to the difficulty which the organs have in getting rid of the waste products arising from this wholesale destruction. How great this may be, a simple calculation will serve to illustrate. If we take a steer weighing 1,000 pounds, the blood in its body will amount to about 50 pounds, if we assume that the blood represents one-twentieth of the weight of the body, a rather low estimate. According to experimental determination at the Bureau station, which consists in counting the number of blood corpuscles in a given quantity of blood from day to day in such an animal, the corpuscles contained in from 5 to 10 pounds of blood may be destroyed within twenty-four hours. The remains of these corpuscles and the coloring matter in them must either be converted into bile or excreted unchanged. The result of this effort on the part of the liver causes

extensive disease of this organ. The bile secreted by the liver cells contains so much solid material that it stagnates in the finest bile canals and chokes these up completely. This in turn interferes with the nutrition of the liver cells and they undergo fatty degeneration and perish. The functions of the liver are thereby completely suspended and death is the result. This enormous destruction of corpuscles takes place to a large extent in the kidneys, where a great number of corpuscles containing the parasites are always found in acute cases. This accounts largely for the blood-colored urine or red water which is such a characteristic feature of Texas fever. The corpuscles themselves are not found in the urine; it is the red coloring matter, or hemoglobin, which leaves them when they break up and passes into the urine.

Symptoms.—After a period of exposure to infected soil, which may vary from thirteen to ninety days, and which will be more fully discussed further on under the subject of cattle ticks as bearers of the Texas fever parasite, the disease first shows itself in dullness, loss of appetite, and a tendency to leave the herd and stand or lie down alone. A few days before these symptoms appear the presence of a high fever may be detected by the clinical thermometer. The temperature rises from a normal of 101° to 103° F. to 106° and 107° F. There seems to be little or no change in temperature until recovery or death ensues. The period of high temperature or fever varies considerably. As it indicates the intensity of the disease process going on within, the higher it is the more rapid the fatal end. When it does not rise above 104° F. the disease is milder and more prolonged.

The bowels are mostly constipated during the fever; toward the end the feces may become softer and rather deeply tinged with bile. The urine shows nothing abnormal during the course of the disease until near the fatal termination, when it may be deeply stained with the coloring matter of the blood. Although this symptom is occasionally observed in animals which recover, yet it may generally be regarded as an indication of approaching death. The pulse and respiration are usually much more rapid than during health.

Other symptoms in addition to those mentioned have been described by observers, but they do not seem to be constant, and only the above are nearly always present. As the end approaches emaciation becomes very marked, the blood is very thin and watery, and the closing of any wound of the skin by clots is retarded. The animal manifests increasing stupor and may lie down much of the time. Signs of delirium have been observed in some cases. Death occurs most frequently in the night.

The course of the disease is very variable in duration. Death may ensue in from three days to several weeks after the beginning of the fever. Those that recover ultimately do so very slowly, owing to the

great poverty of the blood in red corpuscles. The flesh is regained but very gradually, and the animal may be subjected to a second though mild attack later on in the autumn, which pushes the full recovery onward to the beginning of winter.

In the mild type of the disease, which occurs in October and November, symptoms of disease are well-nigh absent. There is little if any fever, and if it were not for loss of flesh and more or less dullness the disease might pass unnoticed, as it undoubtedly does in a majority of cases. If, however, the blood corpuscles be counted from time to time a gradually diminishing number will be found, and after several weeks only about one-fifth or one-sixth of the normal number are present. It is, indeed, surprising how little impression upon the animal this very impoverished condition of the blood appears to make. It is probable, however, that if two animals kept under the same conditions, one healthy and the other at the end of one of these mild attacks, be weighed, the difference would be plainly shown.

Pathological changes observable after death.—In the preceding pages some of these have already been referred to in describing the nature of the disease. It is very important at times to determine whether a certain disease is Texas fever or some other disease, like anthrax, for example. This fact can, as a rule, be determined at once by a thorough microscopic examination of the blood. The necessary apparatus and the requisite qualifications for this task leave this method entirely in the hands of experts. There is, however, a considerable number of changes caused by this disease which may be detected by the naked eye when the body has been opened. These, put together, make a mistake quite impossible. The presence of small ticks on the skin of the escutcheon, the thighs, and the udder is a very important sign in herds north of the Texas fever line, as it indicates that they have been brought in some manner from the South and carried the disease with them, as will be explained later. Another very important sign is the thin, watery condition of the blood, either just before death or when the fever has been present for four or five days. A little incision into the skin will enable anyone to determine this point. Frequently the skin is so poor in blood that it may require several incisions to draw a drop or more.

The changes in the internal organs, as found on postmortem examinations, are briefly as follows: The spleen, or milt, is much larger than in healthy animals. It may weigh three or four times as much. When it is incised the contents or pulp is blackish, and may even well out as a disintegrated mass. The markings of the healthy spleen are all effaced by the enormous number of blood corpuscles which have collected in the spleen and to which the enlargement is due. Next to the spleen the liver will arouse our attention. It is larger than in the healthy state, has lost its natural brownish color, and now

has on the surface a paler yellowish hue. When it is incised this yellowish tinge or mahogany color, as it has been called by some, is still more prominent. This is due to the large amount of bile in the finest bile capillaries, and as these are not uniformly filled with it the cut surface has a more or less mottled appearance. This bile injection causes in many cases a fatty degeneration of the liver cells, which makes the organ appear still lighter in color.

In all cases the gall bladder should be examined. This is distended with bile, which holds in suspension a large quantity of yellow flakes, so that when it is poured into a tall bottle to settle fully one-half or more of the column of fluid will be occupied by a layer of flakes. If mucus is present at the same time, the bile may become so viscid that when it is poured from one glass to another it forms long bands. The bile in health is a limpid fluid containing no solid particles.

If the animal has not been observed during life to pass urine colored with blood or red water, the bladder should be opened. This quite invariably, in acute cases, contains urine which varies in color from a deep port wine to a light claret. In many cases the color is so dense that light will not pass through even a thin layer. The kidneys are always found congested in the acute attack. The disease exerts but little effect on the stomach and intestines beyond more or less reddening of the mucous membrane; hence an examination of these may be safely omitted. The lungs are, as a rule, not diseased. The heart usually shows patches of blood extravasation on the inside (left ventricle), and less markedly on the outer surface.

We have observed jaundice of the various tissues, but very rarely. It has been observed by some quite regularly, however.

During the hot season about 90 per cent of the susceptible mature animals from a noninfected district die, but later, in the cool weather, the disease assumes a milder type, with a consequent decrease in the number of deaths.

The cattle tick, Ixodes bovis (Riley), Boophilus bovis (Curtice), Boophilus annulatus (Stiles and Hassall) as the carrier of Texas fever.—The cattle tick is, as its name indicates, a parasite of cattle in the southern part of the United States. It belongs to the group of *Arthropoda* and to the genus *Ixodes* (*Boophilus*), which is included in the order *Acarina*. Its life history is quite simple and easily traced from one generation to another. It is essentially a parasite, attaching itself to the skin and drawing the blood of its host. It is unable to come to maturity and reproduce its kind unless it becomes attached to the skin of cattle, whence it may obtain its food.

The eggs laid on the ground after the female has dropped from the host begin to develop at once. When the embryo is fully formed within the shell it ruptures this and gains its freedom. The time required from the laying of the eggs to their hatching varies consid-

erably, according to the temperature. In the laboratory in the heat of midsummer this was accomplished in about thirteen days. In the late fall, under the same conditions, it required from four to six weeks. The larva after emerging from the egg is very minute, six-legged, and just visible to the naked eye. If these larvæ be kept on a layer of moist sand or earth in a covered dish, they may remain alive for months, but there is no appreciable increase in size. As soon, however, as they are placed upon cattle, growth begins.

On pastures these little creatures soon find their way onto cattle. They attach themselves by preference to the tender skin on the escutcheon, the inside of the thighs, and on the base of the udder. Yet when they are very numerous they may be found in small numbers on various parts of the body, such as the neck, the chest, and the ears.

The changes which they undergo during their parasitic existence were first studied by Dr. Cooper Curtice in 1889. The young tick within a week molts, and the second or nymphal stage of the parasite's life is thus ushered in. After this change it has four pairs of legs. Within another week another molt takes place by which the tick passes from the nymphal to the sexual, or adult stage. Impregnation now takes place, and, with the development of the ova in the body, the animal takes an increased quantity of blood, so that it becomes very much larger in a few days. That the rapid growth is due to the blood taken in may be easily proved by crushing one. The intestine is distended with a thick, tarry mass composed of partly digested blood. When the female has reached a certain stage of maturity she drops to the ground and begins to lay a large number of eggs, which hatch in the time given above.

The life of the cattle tick is thus spent largely on cattle, and although the young, or larvæ, may live for a long time on the ground in the summer season, they can not mature excepting as parasites on cattle and horses. We have purposely omitted various details of the life history, including that of the male, as they are not necessary to an understanding of our present subject—Texas fever. How this is transmitted we will proceed to consider.

Southern cattle sent North during the spring and summer months carry on their bodies large numbers of the cattle tick. These when matured drop off and lay their eggs on Northern pastures. These hatch, and the young tick soon gets upon any Northern cattle which happen to be on the pasture. As soon as they have attached themselves to the skin they inoculate the cattle, and Texas fever breaks out a week or more thereafter. For many years there had been a growing suspicion that the cattle tick was in some way concerned in the spread of Texas fever, and the facts which supported this supposition finally became so numerous and convincing that a series of experi-

ments were inaugurated by the Bureau of Animal Industry which served to show that the tick was abundantly able to carry the disease to a herd of healthy cattle, and in fact was probably the only agent concerned in the transmission of the disease from Southern cattle to susceptible Northern animals.

The regulations which have been enacted by the Department of Agriculture for the control of cattle shipments from the infected districts have for their initial purpose the prevention of the transportation of cattle ticks from infected regions to those that are noninfected, either upon cattle or in stock cars or other conveyer, and the exclusion of these parasites from noninfected territory has in every instance been found a certain method of excluding Texas fever.

The so-called period of incubation.—After the young ticks have attached themselves to cattle the fever appears about ten days thereafter in midsummer. When the weather is cool, as in autumn, this period may be a little longer. The actual period of incubation may be shorter than this, for if blood from a case of Texas fever be injected into the blood vessels of healthy cattle the fever may appear within five days. When cattle graze upon pastures over which Southern cattle have passed, the time when the disease appears varies within wide limits. When the animals have been put upon pastures immediately after Southern cattle have infected them with ticks, it may take from thirty to sixty days, or even longer, before the disease appears. This will be readily understood when we recall the life history of ticks. The Southern cattle leave only matured ticks which have dropped from them. These must lay their eggs and the latter be hatched before any ticks can get upon native cattle. The shortest period is thus not less than thirty days, if we include ten days for the period of incubation after the young tick has attached itself to native cattle. When the infection of pastures with ticks has taken place early in the season, or when this is cold, the period will be much longer, because it takes longer for the eggs to hatch.

If native cattle are placed upon pastures which have been infected some time before with ticks, the disease will appear so much sooner, because the young ticks may be already hatched and attack the cattle at once. It will be evident, therefore, that the length of time elapsing between the exposure of native cattle on infected fields and the appearance of the disease will depend on the date of original infection and on the weather, whether cold or hot. When native cattle are placed upon fields on which young ticks are already present, they will show the fever in thirteen to fifteen days if the season be hot.

The fever appears before the ticks have matured. In fact, they are still small enough to be overlooked. In any case very careful search should be made for them in those places upon which they prefer to locate—the thighs, escutcheon, and udder. After the acute stage of

the fever has passed by, the ticks begin to swell up and show very plainly.

Prevention.—So far as our experiments have gone they indicate that Texas fever is carried North only by the cattle tick. That there may possibly be other sources of infection can not be denied; but if there be such, they have never been observed. Hence sanitary regulations governing the movement of cattle from the infected districts were adopted by the Secretary of Agriculture with the view of keeping the ticky cattle below the quarantine line. These regulations will be described below.

It is generally accepted that if Southern cattle are entirely freed from that species of ticks known as the *Boophilus annulatus*, they can be allowed to mingle with the most susceptible animals without danger. Among the most important measures to be adopted in eradicating this parasite from cattle in the infected districts may be mentioned the destruction of the ticks on the cattle by means of picking or brushing them off, by smearing the animals with a disinfecting solution, or by dipping the ticky animals in a vat containing a solution capable of killing the ticks without injury to the cattle. When the ticks have been picked or brushed off the cattle, the animals should be carefully examined later for the presence of those young ticks which have matured in the meantime. Greasing the legs and sides of the cattle with lard, cotton-seed oil, etc., will assist in preventing the ticks from crawling up on the body. In small herds smearing the cattle with a mixture of 1 gallon of kerosene, 1 gallon of cotton-seed oil, 1 pound of sulphur, and 2 pounds of pine tar, or with a mixture composed of equal parts of cotton-seed oil and crude petroleum, has proved efficacious when applied daily to the skin during the season. For this purpose sponges, syringes, brushes, mops, or brooms may be used. Many efforts have been made to discover a practicable method of dipping cattle for destroying these ticks without injuring the cattle, and the Bureau of Animal Industry has experimented for years with this object in view. Such treatment, if successful, would relieve most of the Southern cattle from quarantine restrictions, and would make these cattle bring more money in the markets of the country. After many failures, apparent success has been reached by dipping the cattle in the crude oil obtained from certain Texas wells. This oil is heavily charged with sulphur, and in the experiments so far made has not materially affected the cattle. It is necessary to regard such a treatment with some reserve until a large number of animals have been treated under the conditions which obtain in the practical shipment of cattle from the infected district to the markets; but it may be said now that this oil has been tried at the Animal Industry experiment station near Washington with entirely successful results, being distinctly superior to any other

substance tested, and that it has also been tried in the field with about 70 head of cattle, the effect being equally favorable. Arrangements are now made for using the treatment on a much larger number of animals, and if, as hoped, no objections to it develop, it will be of inestimable value to the cattle industry of the Southern States.

The systematic application of one or more of these methods of destroying the ticks upon cattle, together with appropriate measures for ridding the pastures of these parasites, has been successfully adopted in certain sections, and has thus diminished the area of the infected district.

How to rid pastures of ticks without destroying the vegetation on them was for a long time the problem. While this may be impossible on large ranches, it has been successfully accomplished on small farms by dividing the pastures into two parts by a double parallel line of fence, with a 10-foot space between, to prevent ticks from crawling across. One of these pastures is then kept free of cattle for two winters and one summer. After the second winter it will be free of ticks and ready for tickless cattle, when the other pasture is abandoned for the same period of time. When cattle infected with ticks are to be placed on noninfected pastures, it is recommended by Curtice to keep the cattle in a small inclosure for three weeks, after which they should be removed and placed in a similar pen for another three weeks. At this time the cattle should be examined, and if any ticks are observed, they should be placed in a third pen for two weeks more; otherwise, the cattle may be placed in a noninfected pasture. By this system the young ticks mature and drop off, and the animal is removed from the pen before it has time to become reinfected by the hatching of the eggs. Another method of destroying ticks on pastures is to cultivate the soil for a year or more without permitting any cattle upon the ground during this period. After the second winter the field may be restocked with cattle not infected with ticks.

Immunization of Northern cattle.—It is often desirable to ship well-bred cattle into infected districts that they may be used to improve the quality of the native cattle already there. Previous to the discovery of the cause of Texas fever it was found to be well-nigh impossible to introduce purebred cattle from the North into any of the infected regions without suffering great loss, sometimes as high as 90 per cent, within a few months of their arrival at their Southern destination. At first it was thought that the fatalities were due to climatic changes, but later the discovery was made that Texas fever was in reality causing these numerous deaths.

It has now been found practicable to immunize this class of cattle so perfectly that the losses which follow their transportation to a tick-infested region are reduced to a minimum. Young animals, 8 to 12 months old, should, so far as possible, be selected for this purpose, as

they are more readily immunized than adults, are more easily handled, and the dangers which may arise from pregnancy while undergoing the immunizing treatment are thus avoided.

Immunity in these cattle is obtained by introducing the microparasite of the blood into their systems. It may be done by direct artificial inoculation, or by placing virulent young ticks upon the animals and allowing them to perform the inoculation in the natural manner. The subcutaneous injection of a small amount of defibrinated virulent blood has been found, by means of prolonged experiment, the preferable method, as the number of microorganisms introduced can be more accurately gauged from the syringe than by allowing the infection to be produced by the bites of ticks. Two or three inoculations, if repeated at intervals of three weeks, are accomplished with greater safety to the animal than would be possible by means of a single inoculation. The amount first injected should be small, and then gradually increased in the following treatments:

The late summer or fall months have been proved to be the most suitable seasons of the year for making these inoculations, and the cattle should then be shipped South in December or January, for the reason that natural infection with the ticks of the region will be less severe at that season of the year than at any other.

The inoculation always results in a more or less serious attack of Texas fever upon the animal treated. There is fever, great diminution of red-blood corpuscles, and at times a fatal termination, but the proportion of deaths resulting from the inoculation is small when compared with the fatalities among animals taken directly into infected districts. Instead of a loss of 90 per cent among breeding stock taken South it has been shown that by this method of immunization 90 per cent can be saved. In no case should treatment of this nature be undertaken by a person who is not fully versed in the pathology and clinical course of the disease.

Treatment.—When the disease has broken out, all animals, the sick as well as the healthy, should at once be removed to another noninfected pasture. While this may not cut short the disease, it may save the lives of some by removing them from the possibility of being attacked by more young ticks. Removal from infected pastures likewise prevents a second later attack in October or early in November, which is caused by another generation of ticks. It is true that sick natives infect with a new generation of ticks the pasture to which they are removed, but these usually appear so late that they have but little opportunity to do any damage. Hence, sick natives do not, as a rule, cause visible disease in other natives.

It is of importance to remove all ticks, so far as this is possible, from sick animals, since they abstract a considerable amount of blood and thereby retard the final recovery.

Medical treatment of the sick has generally been unsatisfactory, although in chronic cases and those occurring late in the fall beneficial results have followed. If the animal is constipated, a drench containing 1 pound of Epsom salts dissolved in 1 quart of water should be administered, followed by the sulphate of quinine in doses of 30 to 90 grains, according to the size of the animal, four times a day until the system is well saturated with it. Tincture of digitalis one-half ounce, and whisky or alcohol 2 ounces may be combined with the quinine, according to indications of individual cases. An iron tonic containing reduced iron 2 ounces, powdered gentian 4 ounces, powdered nux vomica 2 ounces, powdered rhubarb 2 ounces, and potassium nitrate 6 ounces will be found beneficial in the convalescent stage when the fever has run its course. This tonic should be given in heaping tablespoonful doses three times a day in the food. Good nursing is essential in treating these cases, and the animal should be given a nutritious laxative diet, with plenty of clean and cool drinking water.

Sanitary regulations.—The disease, outside of the infected district, may be prevented by proper regulations governing the movement of cattle from that district during the season of the year that infection is possible. Such regulations are now made yearly by the Secretary of Agriculture. They define the boundary of the infected district, and this year provide that no cattle shall go out of it except for immediate slaughter during that portion of the year included between the dates of February 1 and October 31. At the present time cattle may be moved from said quarantined district for purposes other than immediate slaughter from November 1 to January 31, inclusive, into the noninfected area within the States of Virginia, North Carolina, Tennessee, Texas, and California, and to the States of Missouri and Kansas, and the Territories of Arizona and New Mexico, as may be provided for in the regulations of these States and Territories, and after inspection and upon written permission by an inspector of the Bureau of Animal Industry, or a duly authorized inspector of the State or Territory to which the cattle are destined. From November 1 to December 31, inclusive, cattle from said district may be moved to the noninfected area in the Territory of Oklahoma after inspection and upon the written permission of an inspector of the Bureau of Animal Industry.

All cattle from the quarantined district destined to points outside of the States and Territories above named may be shipped without inspection between November 1 and January 31, inclusive (the open season), without restrictions other than may be enforced by local regulations at point of destination. Cattle from the infected district going to slaughter during the closed season can not be driven, but must be shipped by rail or boat. The waybills and cars are marked

" Southern cattle " when they cross the boundary line, and when they are unloaded for feeding, watering, or sale they are placed in pens set apart for such animals and into which native stock is not allowed to go. The cars and boats which have transported such cattle must be cleaned and disinfected before native stock can be carried.

By these simple regulations the disease has been practically prevented in the noninfected district during the past several years, and little or no hardship has been caused to those shipping or handling cattle from the infected district. This success is one of the best illustrations of the value of proper regulations made in accordance with the principles of veterinary science and intelligently administered.

O